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Physical Processes in Comets

Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109

Ray L. Newburn, Jr.

Strategy

Post-Halley, comets are known to be irregular objects, with most nucleus activity very localized and with the dust coma capable of fragmentation and apparently a source of gas. Older, one-dimensional strategies which assume steady isotropic outflow of material can give poor time-and-space-averaged results, at best. With two-dimendional data, images through interference filters, one can hope to see dust structures that give evidence of the proper geometry for data reduction, study gradients along the axes of symmetry and evidence of fragmentation, and seek evidence for gas abundance gradients associated with the dust. High quality data from brighter comets can then be used to suggest improved data reduction procedures for fainter ones. To obtain such data, large image-quality interference filters have been procured for use with a CCD camera at Lick Observatory, where the scale of the 1 m Nickel reflector is ideal for brighter comets. Whenever possible, data is taken simultaneously with other telescopes and equipment, especially spectroscopy at the Lick 3m or infrared photometry at the IRTF on Mauna Kea.

Progress and Accomplishments

The first data obtained with the new techniques was from P/Brorsen-Metcalf in 1989. Experience from that observing run allowed a much better data set, better photometrically and more complete, to be obtained on Comet Austin during 1990. Both sets are now being processed on the UC Berkeley computers, while models are being developed to fit the data. Completion of older IRTF data-writeups await the return of coworker M. Hanner from sabbatical leave. The proceedings of the Bamberg conference "Comets in the Post-Halley Era" have been completely edited. The 50 papers fill over 1300 pages in two volumes and will be available April 15 from Kluwer Academic Publishers.

Projected Accomplishments

Observations will be made of any comets of opportunity that reach an apparent magnitude of 6 or 7, and observations will be taken during the especially favorable apparition of P/Faye in November. Publication will be completed of older observational data already acquired.

Publications

Newburn, R., Neugebauer, M., and Rahe J., "Comets in the Post-Halley Era," Kluwer, Dordrecht, 1991.

Drechsel, H., Vanysek, V., Newburn, R., and Rahe, J., "Comets in the Post-Halley Era," Comm. on Astrophys., XIV (5), 311-316, 1990.